temperature, and the amount of heat available. The only actuators for control may be the switching times and durations of the relaxation and heat driven modes. Automation of the process can occur using a real-time optimized controller using a low-power embedded computer with cellular connectivity, such as the Raspberry Pi and/or Particle Electron, to allow remote control and data logging of operational units worldwide.

What is claimed is:

1. A directional thermosyphon heat transfer system, comprising:

at least one hollow tube and a first thermally conductive media configured to be in close thermal contact;

wherein a volume of space within the at least one hollow tube can be evacuated of non-condensable gases and selectively filled or drained of a volatile fluid to allow the volume to generate or condense vapor, respectively;

wherein heat from the first thermally conductive media conducted through a wall of the at least one hollow tube into the volume of space within a first bed vaporizes at least some of the volatile fluid at a first temperature, after which the vaporized fluid is transmitted and condensed in a volume of space within a second set of at least one hollow tube in contact with a second thermally conducting media which is at a second temperature lower than the first temperature;

and wherein, when heat from the first thermally conductive media is not vaporizing at least some of the volatile fluid, the system can disconnect the vapor plenums between a first and second set of at least one hollow tube and connect the vapor plenums between a first and third set of at least one hollow tube to allow vapor generated from a third set of at least one hollow tube or a heat source at a third temperature higher than the first temperature flow into the volume of the first set of at least one hollow tube and condense, conducting heat out of the volume through the hollow tube wall and into the first thermally conductive media.

2. The directional thermosyphon heat transfer system according to claim **1**, wherein the volume of space within the first bed is a volume defined as the sum of the volume inside the at least one hollow tube plus the volume of a vapor plenum.

3. The directional thermosyphon heat transfer system according to claim **1**, wherein the liquid from condensing vapor in a first set of at least one hollow tube is returned to a second set of at least one hollow tube from which the condensing vapor originated via an active, powered pump to continue the heat transfer.

4. A directional thermosyphon heat transfer system, comprising:

a first bed containing a first set of at least one hollow tube and a first thermally conductive media configured to be in close thermal contact;

a second bed containing a second set of at least one hollow tube and a second thermally conductive media configured to be in close thermal contact;

wherein a first volume of space within the first set of at least one hollow tube can be evacuated of non-condensable gases and selectively filled or drained of a volatile fluid to allow the first volume to generate or condense vapor, respectively;

wherein a second volume of space within the second set of at least one hollow tube can be evacuated of non-condensable gases and selectively filled or drained of the volatile fluid to allow the second volume to generate or condense vapor, respectively; and

wherein the system is further configured to satisfy at least one of:

heat from the first thermally conductive media is configured to be conducted through a wall of the first set of at least one hollow tube into the first volume of space within the first bed vaporizes at least some of the volatile fluid at a first temperature, after which the vaporized fluid is transmitted and condensed in a volume of space within the second set of at least one hollow tube in contact with the second thermally conducting media which is at a second temperature lower than the first temperature; or

heat from the second thermally conductive media is configured to be conducted through a wall of the second set of at least one hollow tube into the volume of space within the second bed vaporizes at least some of the volatile fluid at a third temperature, after which the vaporized fluid is transmitted and condensed in a volume of space within the first set of at least one hollow tube in contact with the first thermally conducting media which is at a fourth temperature lower than the third temperature.

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